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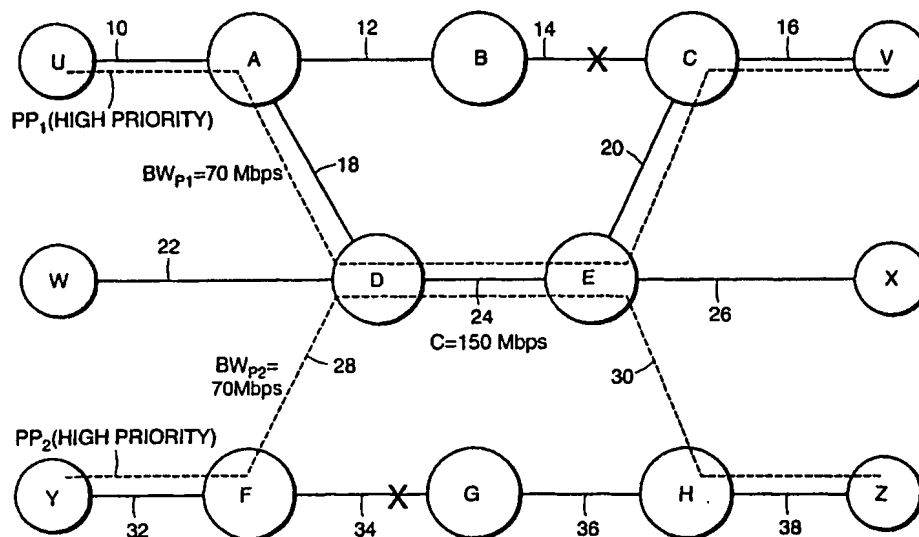
(74) Agents: JOHNSON, Rodney, D. et al.; Hamilton, Brook, Smith & Reynolds, P.C., Two Militia Drive, Lexington, MA 02421 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: METHOD AND SYSTEM FOR PATH PROTECTION IN A COMMUNICATIONS NETWORK



(57) Abstract: A system and method for fast and reliable failure notification and accelerated switchover for path protection in a communications network of nodes interconnected by communications links is described. A method of path protection includes establishing plural working paths through the nodes. For each working path, an associated protection path is assigned. Upon a failure event, working paths that include the failed link are switched to their respective protection paths. The working and protection paths can include links on different networks having different media. At each node, linked lists for protection path activation, working path deactivation and path preemption are implemented upon a failure event.

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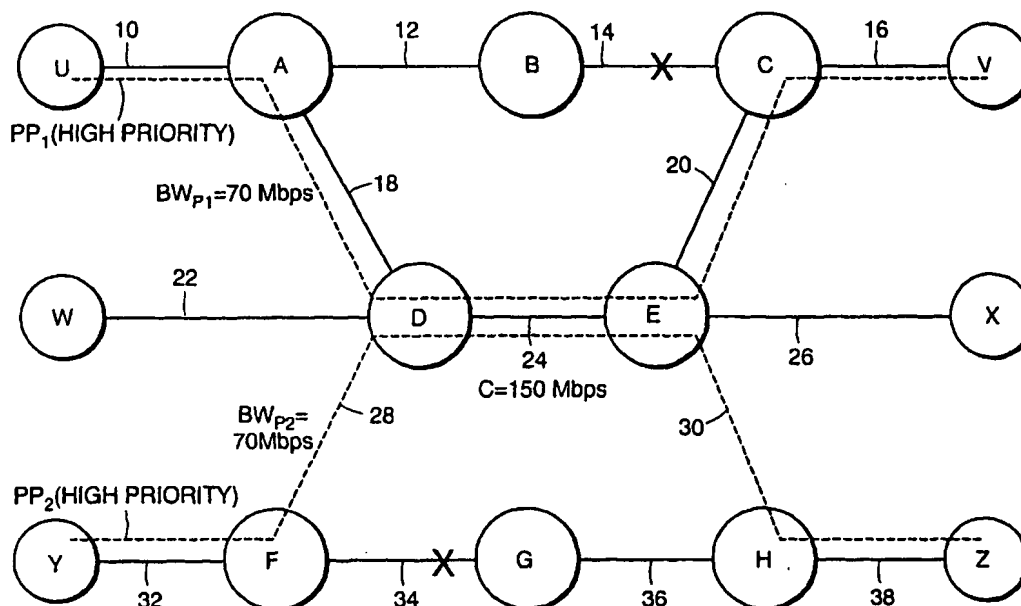
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(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,

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7 June 2001

Published:

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/56 H04Q11/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 0 836 344 A (NIPPON ELECTRIC CO) 15 April 1998 (1998-04-15) column 10, line 21 -column 13, line 25	1,2,5,6, 9,10,13, 36,39 3,4,7,8, 11,12, 14-19, 37,38,40
X A	EP 0 828 400 A (NIPPON ELECTRIC CO) 11 March 1998 (1998-03-11) column 3, line 5 -column 6, line 24	1,9, 16-18, 36,39 2-8, 10-15, 19,37, 38,40

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

18 December 2000

Date of mailing of the international search report

19. 03. 2001

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	VEITCH P ET AL: "ATM NETWORK RESILIENCE" IEEE NETWORK: THE MAGAZINE OF COMPUTER COMMUNICATIONS,US,IEEE INC. NEW YORK, vol. 11, no. 5, 1 September 1997 (1997-09-01), pages 26-33, XP000699938 ISSN: 0890-8044 page 30, left-hand column, last paragraph -page 31, left-hand column, paragraph 2 -----	1-19, 36-40
A	RYUTARO KAWAMURA ET AL: "SELF-HEALING VIRTUAL PATH ARCHITECTURE IN ATM NETWORKS" IEEE COMMUNICATIONS MAGAZINE,US,IEEE SERVICE CENTER. PISCATAWAY, N.J., vol. 33, no. 9, 1 September 1995 (1995-09-01), pages 72-79, XP000528012 ISSN: 0163-6804 page 74, left-hand column, paragraph 2 -page 76, left-hand column, paragraph 2 -----	1-19, 36-40

INTERNATIONAL SEARCH REPORT

international application No.
PCT/US 00/15457

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-19, 36-40

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-19,36-40

Method and apparatus for path protection

2. Claims: 20-32

Method of failure notification

3. Claims: 33-35

Apparatus in a communication node comprising a message bus

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0836344 A	15-04-1998	JP 2806374 B	30-09-1998
		JP 10065680 A	06-03-1998
		AU 719175 B	04-05-2000
		AU 3427197 A	26-02-1998
		CA 2213304 A	19-02-1998
		US 6041037 A	21-03-2000
EP 0828400 A	11-03-1998	JP 2933021 B	09-08-1999
		JP 10065686 A	06-03-1998
		CA 2213363 A	20-02-1998
		US 5933422 A	03-08-1999